

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the mask for thin film pattern membrane formation.

[0002]

[Description of the Prior Art] The color liquid crystal display of a TFT method equips with the color filter the location which counters a liquid crystal layer. A transparent conductive thin film which is represented by the ITO film for the drive of liquid crystal is formed by this color filter. The masking spatter method the sputtering method uses a metal mask, and generally forms and forms a desired thin film pattern on a color filter as the membrane formation approach is learned as a conventional technique.

[0003]

[Problem(s) to be Solved by the Invention] To however, the color filter of multiple picking which has the pattern of the 6th [or more] page per substrate Since a mask deforms during membrane formation by the thermal expansion of a metal mask and adhesion with a color filter gets worse, when ITO which is one of the transparence electric conduction film is formed using the conventional metal mask, The membrane formation defect called the pattern dotage from which the boundary part of the ITO film becomes not clear to the color filter after membrane formation arises, and the problem that a desired thin film pattern is not obtained arises. The membrane formation precision of an ITO film pattern is one of the important quality elements of a color filter, and when the membrane formation precision is bad, the display defect of a liquid crystal display may be caused.

[0004] This invention improves the fault by this conventional technique, and aims at offering the mask for thin film pattern membrane formation which can be considered as the good color filter which formed the desired thin film pattern on the above multiple picking color filters especially.

[0005]

[Means for Solving the Problem] It is characterized by the mask for thin film pattern membrane formation concerning this invention being in within the limits whose pulse duty factor of dummy opening in this mask is 2 - 20% while preparing dummy opening in the perimeter further in addition to original pattern opening.

[0006] By this dummy opening, the thermal expansion of the mask under thin film membrane formation can be absorbed, the adhesion between a mask and a color filter can be maintained, and a color filter without a membrane formation defect can be obtained.

[0007]

[Embodiment of the Invention] In addition to original pattern opening, this invention is characterized by preparing dummy opening in the perimeter further in the mask for thin film pattern membrane formation. Furthermore, the pulse duty factor of dummy opening in this mask is characterized by being in within the limits which is 2 - 20%.

[0008] Dummy opening is prepared in the outside of the cutting schedule part of a substrate. Moreover, 2 - 20% of the mask area pulse duty factor of dummy opening is suitable. At less than 2%, since pattern dotage occurs without playing the role of absorption of thermal expansion, it is not desirable. Moreover, if 20% is exceeded, since it will become easy to deform when washing of the depository film by blasting is repeated and the flatness of a mask will be spoiled, it is not desirable. The mask area pulse duty factor of dummy opening is 9 - 11% still more preferably.

[0009] Since the thin film formed by dummy opening is a part removed by cutting processing at a back process, it is satisfactory at all for a product.

[0010] Moreover, as for the quality of the material, it is [the mask for thin film membrane formation concerning this invention] desirable that they are metals in consideration of enabling use of handling nature and multiple times, such as stainless steel and 42 alloys.

[0011]

[Example] The example which forms the ITO film which is one of the transparence electric conduction film is given to the color filter of 3.5 inch x20 chamfering of the edge as one or less example and an example of this invention.

[0012] Drawing 1 is a block diagram before membrane formation of the mask for thin film pattern membrane formation given in the example of this invention, and drawing 2 is a block diagram after membrane formation of drawing 1.

[0013] This color filter is cut after ITO film membrane formation in size of 360x465 to 320x400mm. In addition, a 320x400mm color filter pattern is in the center section of 360x465mm substrate before cutting.

[0014] First, it explains from the structure of the mask for this invention thin film pattern membrane formation. As shown in drawing 1, the original color filter pattern opening 2 is formed in a stainless steel plate with a 470mm [360mm by] thickness of 2mm. Then, the dummy opening 3 is formed in the perimeter, and the mask 1 for pattern

membrane formation for thin films is manufactured.

[0015] At this time, the mask area pulse duty factor of the color filter pattern opening 2 is about 50%, and the mask area pulse duty factor of the dummy opening 3 is 10%.

[0016] Next, using this mask 1, as shown in drawing 2, the pattern which becomes the color filter substrate 4 of 3.5 inch x20 chamfering of the edge from the ITO film is formed. The membrane formation approach of the ITO film is the sputtering method. Membrane formation conditions are [200 degrees C and the thickness of the pressure of 0.2Pa and temperature] about 140nm.

[0017] As a result of inspecting the appearance after ITO membrane formation, it checked that patterning was carried out to the position that not every membrane formation pattern has membrane formation defects, such as dotage.

[0018] Although the color filter of 200 sheets was formed using this mask, membrane formation defects, such as dotage, were not seen at all.

[0019] A 360x465mm substrate is cut to 320x400mm by cutting processing after ITO film membrane formation. Since the dummy membrane formation part 7 formed through the dummy opening 3 of a mask 1 was designed so that it might be removed at the time of this cutting processing, it is satisfactory at all as a product.

[0020] To the stainless steel plate of example of comparison 1 example, and the same size, the mask for thin film membrane formation in which only the pattern opening 2 was formed was manufactured, and the ITO film was formed on these conditions to it at the same color filter as an example. As a result of forming membranes to 100 sheets, in total, membrane formation defects, such as pattern dotage, were seen mostly. Many pattern dotage especially in the substrate center section was checked.

[0021] After forming the pattern opening 1 in the stainless steel plate of example of comparison 2 example, and the same size, the mask which prepared dummy opening of 21% of mask area pulse duty factors was manufactured, and the ITO film was formed on these conditions to the same color filter as an example. As a result of forming membranes to 24 sheets, although generating of pattern dotage was not seen, the crack by contact on a mask was looked at by 11 sheets of an abbreviation moiety. Since the reinforcement of a mask fell since the mask area pulse duty factor of dummy opening was too large, and it deformed, flatness is spoiled, a pattern edge and a substrate contact, and a crack occurs.

[0022]

[Effect of the Invention] According to this invention, membranes can be formed without generating membrane formation defects, such as pattern dotage, at the time of membrane formation of the transparent conductive thin film of color filter **, and, also still in quality, a good color filter can be obtained. The effectiveness is especially remarkable at the time of membrane formation of the transparent conductive thin film to the multiple picking color filter of the 6th [or more] page per substrate.

[Translation done.]